Data Manipulation

Role of Controller

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Direct Memory Access

- ✓ Since Controller is attached to computer bus.
- ✓ It can communicate to main memory in those nanosecond when CPU is using bus.
- ✓ This ability of computer to access main memory is called **DMA**

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Direct Memory Access

Why DMA

✓ It is time consuming to involve CPU for I/O and CPU is waiting for the I/O and supervising whether the I/O has been performed or not.
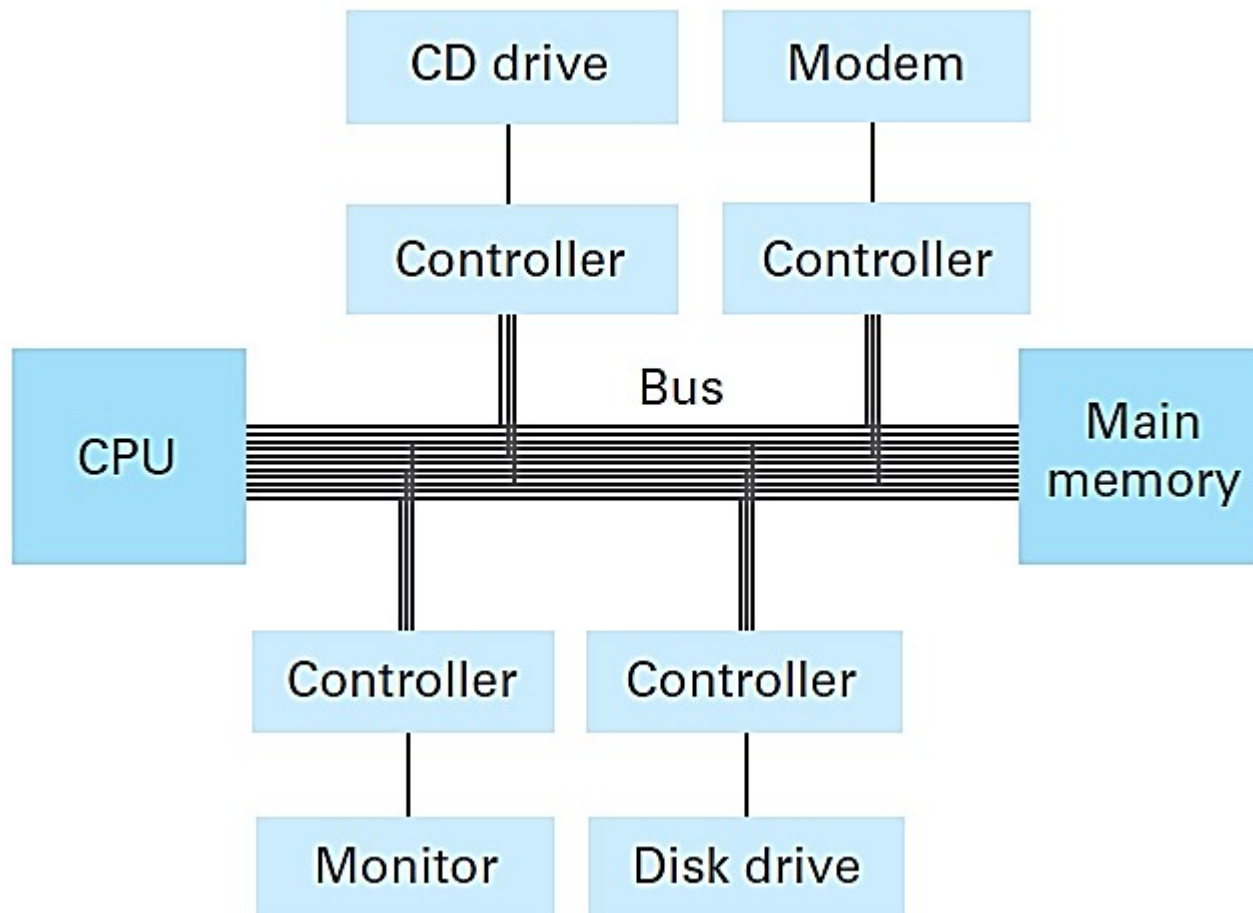
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Direct Memory Access

Scenario

- ✓ CPU asks controller to read data from some peripheral device or from one portion of the main memory and place it at a designated place in the memory.
- ✓ In the meanwhile CPU is free to perform other operations.
- ✓ Resource efficient.

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Direct Memory Access
Scenario in action

Direct Memory Access

Von **Neumann** Bottleneck

- ✓ CPU and main memory
- ✓ CPU and each controller
- ✓ Each controller and main memory.
- ✓ CPU and controller are competing for the bus access.

Handshaking

Why we need
- ✓ CPU wants to send data to printer
- ✓ CPU speed is faster than printer could print them
- ✓ We need a constant handshake, acknowledgement where the peripheral device has reached.

Handshaking

How it works

✓ Peripheral device like printer can constantly telling its status to CPU like work done, paper jam, out of paper etc in the form of a bit pattern.

Summary

Direct Memory Access and Handshaking

- ✓ Controller accessing the main memory.
- ✓ Benefits for CPU
- ✓ Von Neumann Bottleneck
- ✓ Handshaking